Musculoskeletal Disorders/ Office Ergonomics

Center Operations Directorate

Occupational Medicine and Environmental Health Services

AD60M / 544-2390

- ***AD60M personnel will present this topic for you, as human resources allow***
- ***Call to schedule meeting time***
- ***First come, first served***

THIS JOB COULD BE A REAL MUSCLE STRAIN

-Viktor-

Photo by Vincent Laforet / The New York Times

Introduction To
Work-Related Musculoskeletal Disorders (WMSDs)

- WMSDs arise from repeated stress to the body in the workplace
- WMSDs are associated with specific workplace risk factors
- Include a variety of injuries and illnesses – to muscles, tendons, ligaments, nerves, joints, cartilage, bones
- They are not diagnoses
- WMSDs are a group of work-related disorders that share similar characteristics

Common WMSDs

- Tendonitis – irritation of a tendon resulting from repeated force or stress on that muscle/tendon group.
- Lateral epicondylitis (tennis elbow) – irritation of the tendons attached on the outside of the elbow, caused by activities that have jerky throwing motions or impact (Ex: screwdriver use).
- Medial epicondylitis (golfer's elbow) – irritation of the tendon attachments on the inside of the elbow, resulting from activities that require repeated or forceful rotation of the forearm and bending of the wrist at the same time.

Additional Common WMSDs

- **Trigger finger – results from a tendon surface becoming irritated, rough and inflamed (Ex: repeated use of a staple gun or pair of pliers). This can result in a loss of free movement in that joint area.**

- **deQuervain's disease – related to trigger finger, but involves the tendons on the radial side (thumb side) of the wrist. Constriction of these tendons pulls the thumb back from the hand, causing severe pain and limited thumb movement or use.**

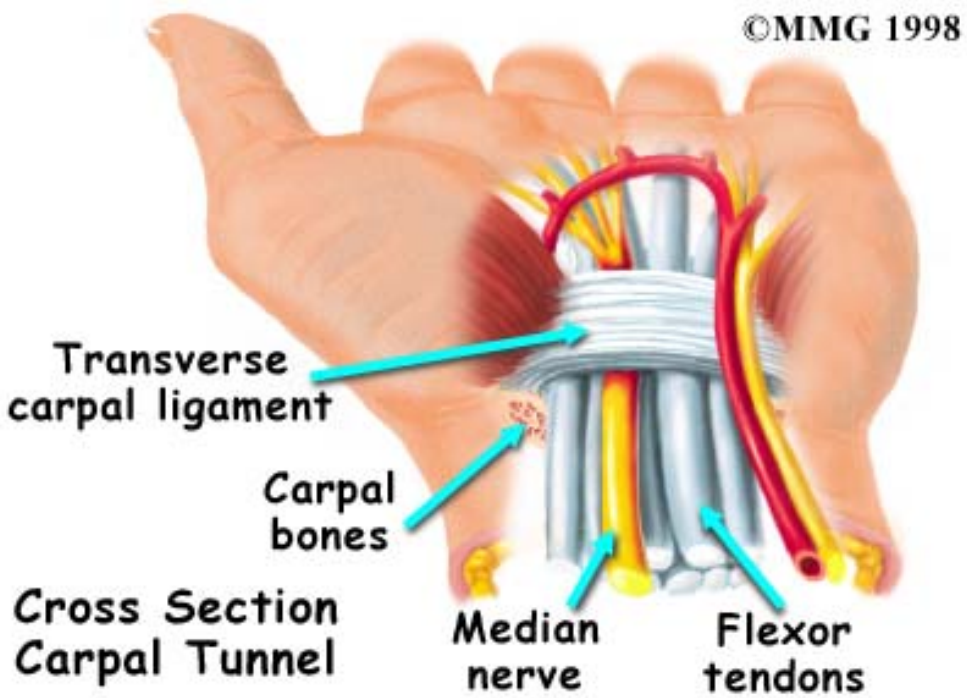
Additional Common WMSDs

- **Raynaud's phenomenon - caused by the reflexive constriction of the small arteries, which causes the fingers to become white (pale) and feel cold, numb, and tingly (Ex: prolonged hand-arm vibration from powered hand tools). Also called white finger or vibration syndrome.**

- **Thoracic outlet syndrome – compression of the nerves and blood vessels between the neck and shoulder (Ex: working with the arms above shoulder height, and pulling the shoulders back and down). Symptoms include finger and hand numbness.**

Carpal Tunnel Syndrome (CTS) – Most Common WMSD

- Tendons (tough, non-stretchable, flexible fibers) connect forearm muscles to wrist and finger bones.
- Tendons enter wrist through a U-shaped cluster of 8 bones, the carpal bones, forming the ‘back’ and ‘sides’ of wrist.
- Ligament across ‘top’ of wrist links bones together at joint, forming the arch of the carpal bones, or the ‘roof’ of the carpal tunnel.
- Forearm’s median (middle) nerve runs through this tunnel to the palm and some fingers.
- When wrist is forced into an unnatural posture (Ex: by typing on a straight keyboard), that nerve is compressed.



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Carpal Tunnel Syndrome (CTS) – Most Common WMSD

- Median nerve is surrounded by the tendon sheaths (tubular sacs lined with a thin layer of tissue, and a layer of oily lubricating fluids).
- Continued tendon activity and pressure on the tunnel can cause inflammation, putting pressure on the nerve, and eventually resulting in nerve damage or CTS.

CTS Symptoms

- **Burning pain**
- **Numbness**
- **Tingling in the thumb and first two or three fingers**

Symptoms may radiate to the forearm.

Symptoms are frequently suffered at night.

Many find weakness or numbness makes simple tasks, such as tying shoelaces, hard to perform.

Numbness Caused By Carpal Tunnel Syndrome

CTS: Workplace Risk Factors

- Fixed hand position for prolonged periods (Ex: installing overhead electrical wiring).
- Repeated wrist and finger flexion (Ex: operating a hand tool).
- Light, highly repetitive wrist and finger movements (Ex: typing).
- Repeated wrist hyperextension (wrist and hand bent backwards) or flexion (Ex: painting).
- Prolonged strenuous use of the hands (Ex: molding materials).
- Repeated pinching or grasping (Ex: inspecting materials).
- Vibration, particularly when associated with power tools.
- Bending the wrist toward the little finger (Ex: typing).
- Acceleration and velocity of dynamic motions (Ex: scanning items in a checkout line).

Second Most Common WMSD: Low Back Pain

Focus on Prevention:

- Reduce exposure to known risk factors: repetition; awkward postures; or stress on muscles, tendons, joints, or lower spine.
- Condition or train muscles to have a greater tolerance for physiological stress.
- Lose weight. Extra pounds, especially around the middle, increase stress on lower back.
- Stop smoking. Smoking can interfere with blood circulation to lower back, and a constant cough can bring on a back spasm.
- Exercise daily. Choose an activity that is easy on your back, such as walking or swimming.

Overall Ergonomic Risk Factors

- Static postures
- Awkward positions
- Repetitive motions
- Forceful use of muscles
- Compression of nerves or skin
- Extreme cold
- Personal factors

PREVENTION Is The Key

Much WMSD prevention information is available, such as:

- **Use only tools with the handle thickness, shape, and length appropriate for the job**
- **Use only trigger-operated tools that allow room for 2-3 fingers on the trigger**
- **Avoid awkward postures**
- **Keep wrist and other joints in a neutral plane whenever possible**
- **Use cylindrical hand grips without sharp edges**

PREVENTION Is The Key

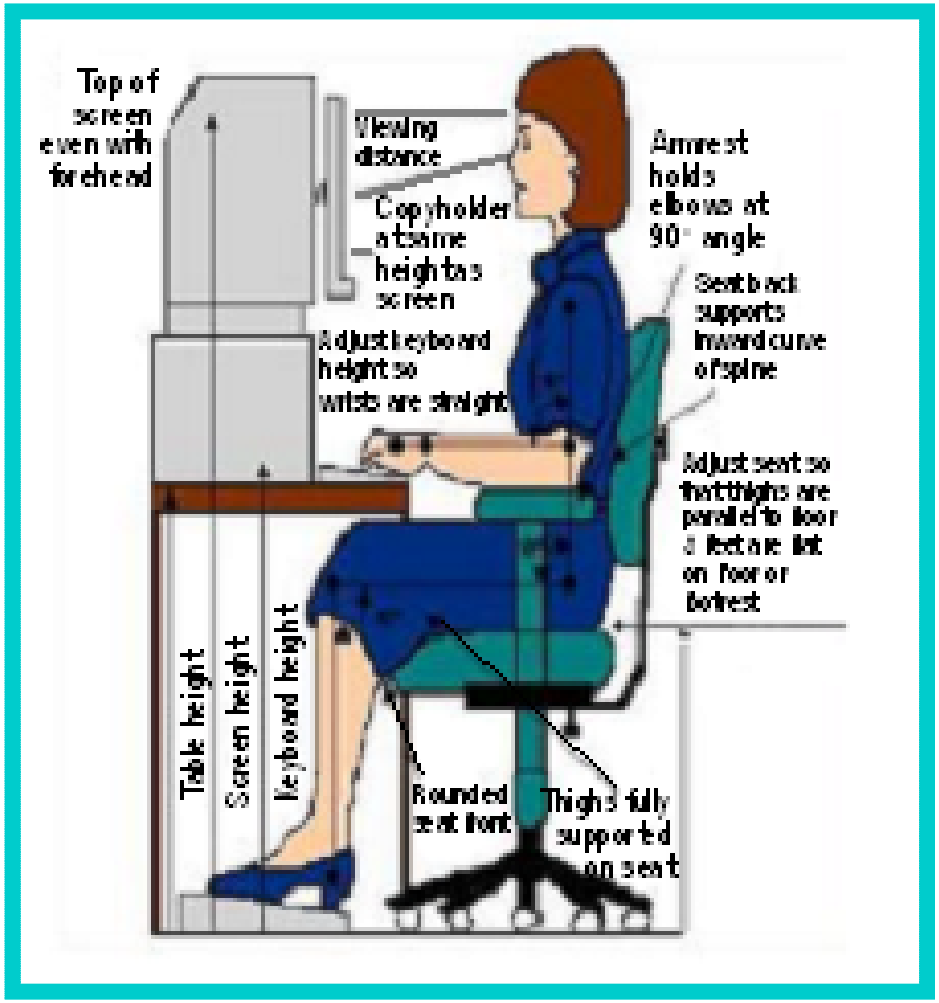
Avoid:

- **Lifting or lowering an item with one hand, and/or rough, jerking motions**
- **Lifting, lowering, or carrying bulky objects that can't be held close to the body**
- **Lifting or lowering in cramped work areas, where twisting the upper body may be necessary**
- **Pulling actions -- use a pushing action whenever possible**

You Think *YOU* Have Problems?

Your Computer Workstation: Proper Posture

- Back in neutral position
- Knees bent at a 90^0 angle
- Shoulders relaxed
- Feet flat on floor or foot rest
- Wrists straight
- Forearms parallel with floor
- Elbows close to body



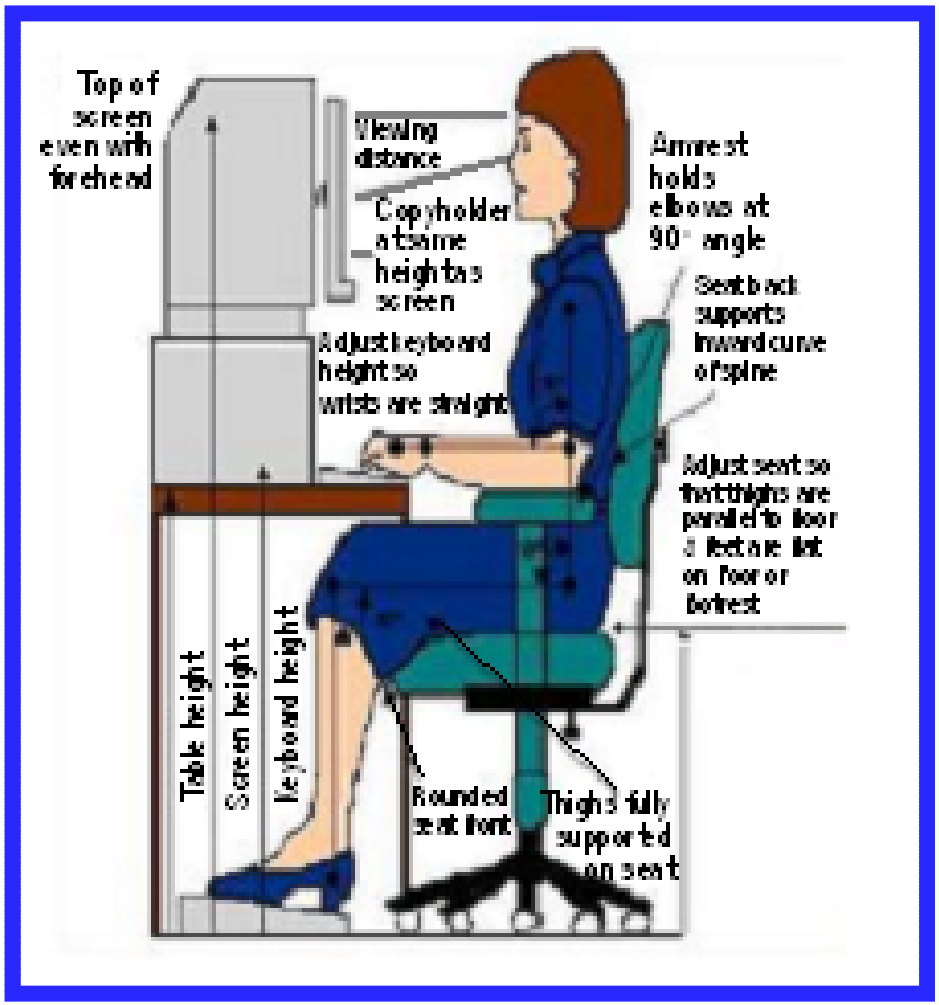
Your Computer Workstation: Basic Design

Work Surface

- Place about 2-4 inches below elbow height
- Hold elbows close to body, at a 90º angle
  - If too high, shoulders will be hunched up
  - If too low, worker will be bent forward

Edges

- Pressure can compress nerves
- Use rounded or padded edges where arms rest



Your Computer Workstation: Chair Design

Back Support
- Properly supports lower back

Seat Pan
- Large enough not to feel confining
- Allows room for 2-3 fingers between seat front and knee bend when sitting fully back

Base
- Has 5 legs for stability
- Same diameter as seat pan

Armrests
- Adjustable height

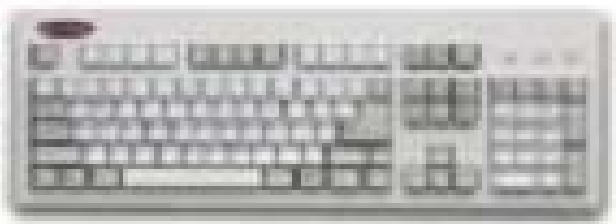
Adjustable height and tilt
- Controls within easy reach
- Allows incremental adjustments
- Tilt adjusts for backward incline

Your Computer Workstation: Other Design Factors

Monitor

- Position screen to put top line of type at or slightly below eye level
- Use a lower monitor height for bifocal wearers
- Position directly behind keyboard and in front of user--never at an angle

Keyboard



- Position directly in front of user
- Form 90^0 angle at elbows when using
- Keep wrists straight

Your Computer Workstation: Other Design Factors

Glare

- Position monitor screen at a 90^0 angle to windows
- Place curtains, blinds, or filters on windows
- Tilt monitor down slightly
- Other options may be required:
  - Louvers on overhead lighting
  - Monitor hoods
  - Anti-glare filters

Task Lighting

- Position light where it won't shine in worker's eyes
- Don't direct light at screen
- Don't use light strong enough to create high contrast

Your Computer Workstation: Accessories

Wrist Supports--keyboard and mouse

- Used to help maintain correct wrist posture
- Prevents nerve compression
- Should be soft with porous covering

Footrests

Lumbar support cushions

Phone rests/headsets

- Avoid holding phone receiver between shoulder and head

Mouse/Tractball

- Position next to and on the same level as keyboard

Document holders

- Place directly beside monitor screen

Your Computer Workstation: Accessories

New Furniture Is Not A 'Fix-All'

- Current workstation may need only simple adjustments
- Find innovative ways to achieve better positions
  - Use a telephone book to raise monitor to proper height

Remember Safety When Being Innovative!

Things Could Be Worse!

Additional Resources

ErgoSmart:
http://health.msfc.nasa.gov/ErgoSmart/index.htm

Office Ergonomics:
http://office-ergo.com/

Oklahoma State:
http://www.pp.okstate.edu/ehs/modules/ergo/Ergon1.htm

ErgoWorld:
http://www.interface-analysis.com/ergoworld/office.htm

DOD:
https://www.denix.osd.mil/denix/Public/Library/Ergonomics/Musculoskeletal/wmsd.html#erg

OSHA:
http://www.osha-slc.gov/SLTC/computerworkstations_ecat/index.html

Other NASA sites:
http://ohp.ksc.nasa.gov/topics/ergo/